

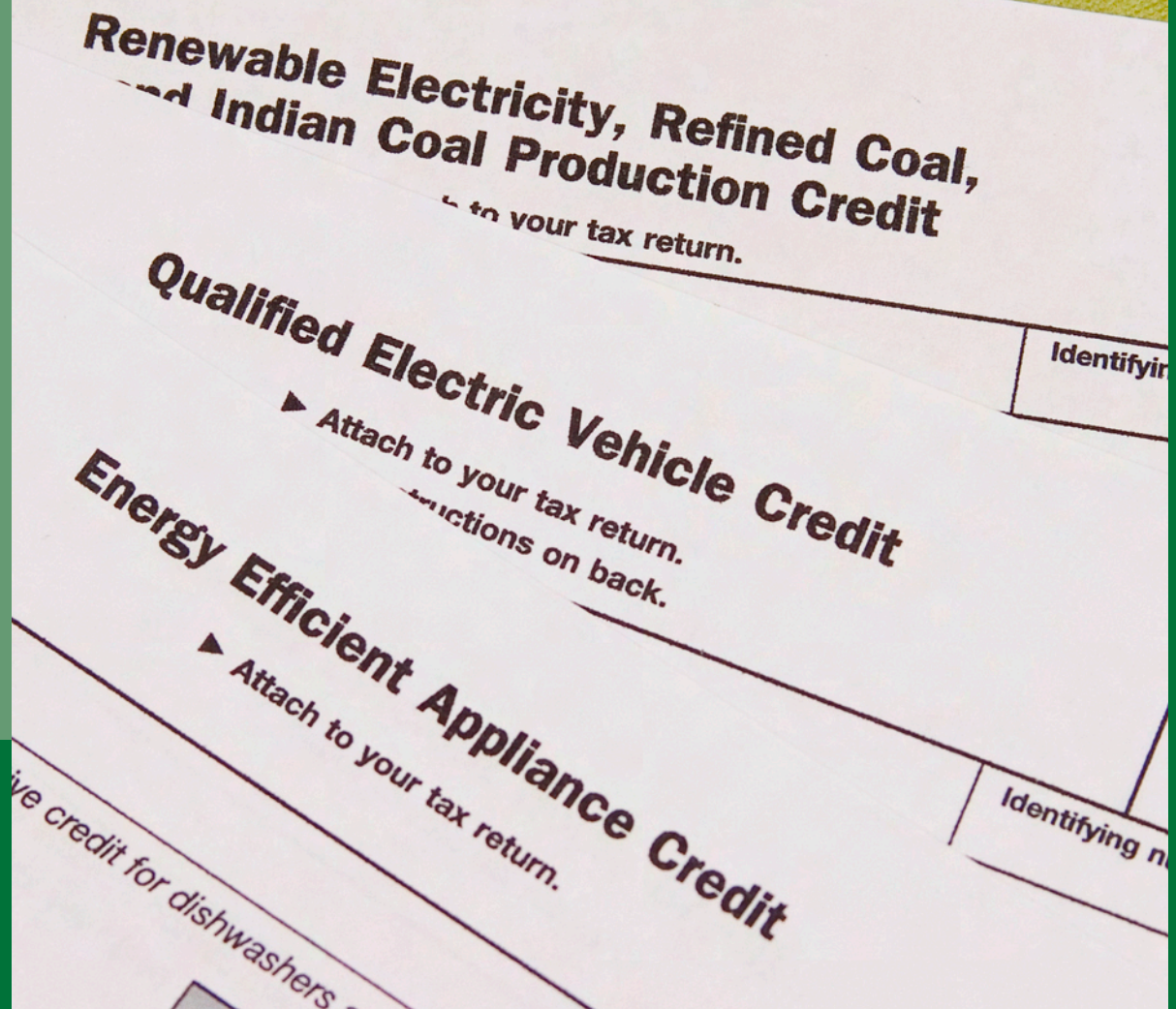
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Economics
Standard
12.3.1.



Supporting Materials California Education and the Environment Initiative

DRAFT
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The Role of Government in Environmental Economics

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California Education and the Environment Initiative

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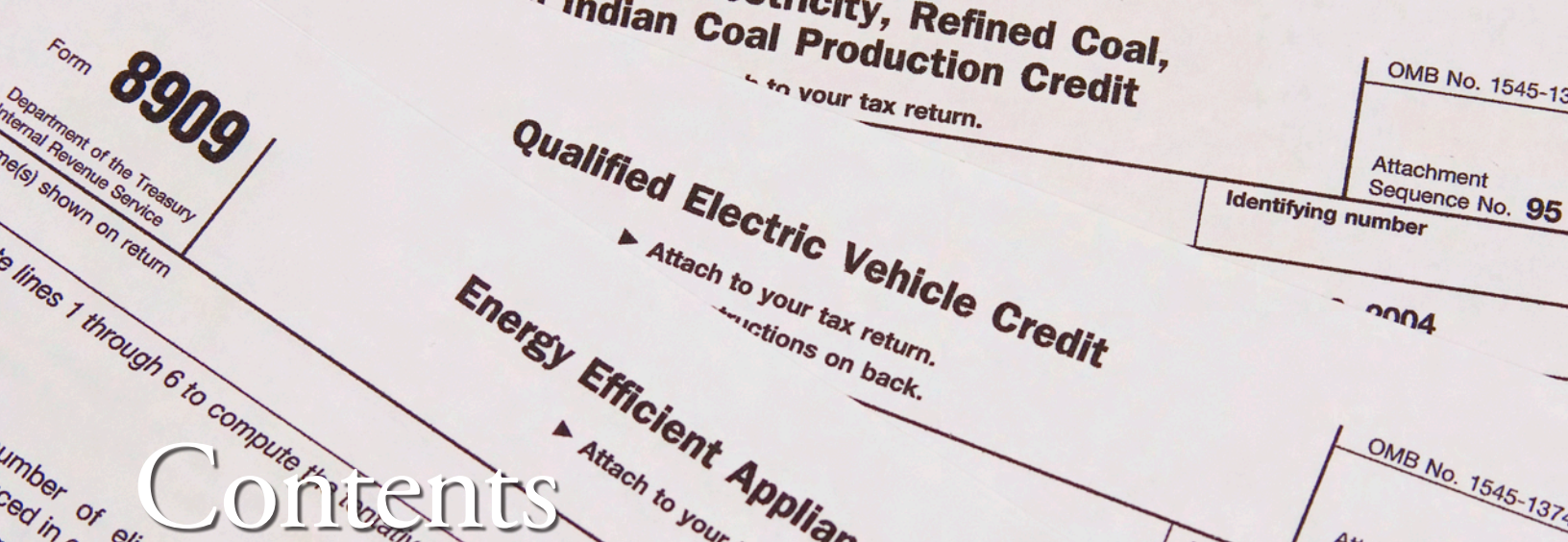
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Multiple Choice: Select the best answer and circle the correct letter. (1 point each)

1. Which of the following is a problem with electronic waste?
 - a. Electronic waste can release lead and mercury into the environment.
 - b. Consumers discard electronic products because they break quickly.
 - c. Manufacturers spend a lot of money researching new electronic products.
 - d. People scavenge at landfills and take the discarded electronic products.
2. What is an eco-industrial park?
 - a. a place where companies produce environmentally friendly products.
 - b. a national park that is protected by federal regulations.
 - c. a cooperative where businesses share resources and reduce waste.
 - d. a business that collects electronic waste and sells recycled products.
3. Which of the following is an example of “symbiosis” in the Kalundborg, Denmark eco-industrial park?
 - a. A refinery takes used water to use as coolant.
 - b. Used cell phones are updated and repackaged.
 - c. Sludge from a fish farm is used as fertilizer.
 - d. Surplus yeast is used to make medicines.
4. The *Exxon Valdez* case demonstrated which of the following?
 - a. Corporations can often reduce or eliminate fines and punitive damages.
 - b. Exxon was not at fault, because its policies were good, even if they weren’t followed.
 - c. Fines against corporations prevent them from making similar mistakes in the future.
 - d. Cleanup efforts show that ecosystems can be returned to their pre-accident condition.
5. When the automotive industry sued the state of California over the Zero Emissions law,
 - a. the Bush administration joined in the suit against the state.
 - b. the U.S. EPA backed up the state of California 100%.
 - c. consumer groups joined in the suit opposing the law.
 - d. the courts found that the law was reasonable.
6. One reason automotive companies said they objected to the Zero Emissions law was because:
 - a. hydrogen fuel cell technology was too limited.
 - b. consumers did not want to pay the high prices.
 - c. electric cars break down too often to be practical.
 - d. auto companies do not believe cars cause pollution.

Name: _____

7. Tax shifting strategies such as those used in Europe are examples of:
 - a. fiscal policy.
 - b. monetary policy.
 - c. command and control policies.
 - d. popular policies.
8. Subsidizing low-emission high-mileage cars during the Clinton administration is an example of a:
 - a. fiscal policy.
 - b. monetary policy.
 - c. command and control policy.
 - d. popular policy.
9. Clinton's Partnership for New Generation of Vehicles was a failure because:
 - a. after spending \$1.5 billion, no new technology was developed.
 - b. there were no incentives created to encourage the adoption of the technology.
 - c. automotive companies were forced to comply with standards.
 - d. monetary policy is rarely successful in these cases.
10. Tax shifting:
 - a. uses taxes to discourage undesirable activities.
 - b. uses revenue to fund controversial programs.
 - c. is generally supported by businesses.
 - d. is usually opposed by tax-paying individuals.
11. Another way of looking at tax shifting is that it is:
 - a. an excise tax (sin tax).
 - b. a sales tax.
 - c. an income tax.
 - d. a subsidy.
12. All of the following are examples of using taxes to discourage detrimental environmental practices, except:
 - a. a tax on plastic bags.
 - b. high taxes on cars.
 - c. registration fees for pesticide manufacturers.
 - d. research on zero-emission vehicles.
13. Which of the following is the biggest concern driving the opposition to tax shifting?
 - a. Taxes discourage business, and this could cost jobs and hurt the economy.
 - b. Once the taxes force the economy to change, government revenue would dry up.
 - c. People would pay the tax and nothing would change in the environment.
 - d. The market will take care of the environment without government interference.

The Role of Government in Environmental Economics

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Name: _____

14. All of the following technologies were created under the Partnership for a New Generation of Vehicles except:
- a. a carbon coating that is better than Teflon.
 - b. an electric motor.
 - c. cleaner diesel technology.
 - d. hybrid technology.
15. Banning DDT is an example of a:
- a. fiscal policy.
 - b. monetary policy.
 - c. command and control policy.
 - d. a popular policy.
16. Which of the following is not a fiscal policy tool used to protect the environment?
- a. tax shifting
 - b. tax credits
 - c. subsidies
 - d. command and control
17. Which of the following is part of emissions trading (cap and trade)? All of the following are part of the cap and trade strategy except:
- a. Industries set a standard for acceptable emissions.
 - b. The government buys and sells emissions credits.
 - c. Companies that exceed the emission standards may sell credits.
 - d. Government gives industries the tools to meet emission standards.
18. Where is the largest carbon emissions trading program?
- a. the European Union
 - b. Japan
 - c. Chicago
 - d. California
19. Title IV of the Clean Air Act used a cap and trade program to successfully remove which component of acid rain?
- a. sulfur dioxide
 - b. carbon monoxide
 - c. carbon dioxide
 - d. ozone

The Role of Government in Environmental Economics

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Name: _____

20. In its early years, the Environmental Protection Agency used mostly what kind of policies?

- a. fiscal policies
- b. monetary policies
- c. command and control policies
- d. popular policies

Matching Definitions: Match each term with its correct definition. (1 point each)

- | | |
|---------------------------------------|---|
| _____ 1. Biomass | A. environmental business cooperatives |
| _____ 2. Eco-industrial Parks | B. waste products used to create energy |
| _____ 3. E-waste | C. disposed electronic devices |
| _____ 4. Negative externalities | D. government helps reduce the cost of production |
| _____ 5. Symbiosis | E. automobiles that do not produce any exhaust |
| _____ 6. Zero Emission Vehicles | F. investing in emissions reductions in foreign countries |
| _____ 7. Excise tax/sin tax | G. government uses taxes or spending |
| _____ 8. Fiscal policy | H. unaccounted costs imposed on those who do not benefit |
| _____ 9. Carbon sink | I. gases which trap the heat of the Sun |
| _____ 10. Command and control policy | J. charging those who use a product |
| _____ 11. Greenhouse gases | K. emissions credits bought and sold |
| _____ 12. Cap and trade strategy | L. banning of the DDT pesticide |
| _____ 13. User fees | M. used to discourage use of product such as cigarettes |
| _____ 14. Subsidy | N. trees and forests as an absorbent |
| _____ 15. Clean Development Mechanism | O. relationship of mutual benefits |

Name: _____

Short Answer Questions: (2 points each)

1. Other than buying a credit from another company or spending the money on expensive equipment, what can a company do in order to comply with pollution standards in a cap and trade strategy?

2. Why is “additionality” necessary in a Clean Development Mechanism?

Name: _____

Essay Assignment

Why is government intervention often necessary for protecting the environment? What are the best approaches for accomplishing environmental protection? Explain why these are the best approaches.

Directions

Use these guidelines to focus your writing:

- Write 500–750 words.
- Provide examples from our study of the role of government in environmental economics.
- In your essay, use the terms and concepts in the following list. They will help you remember the key points to address, and you will be assessed on how many of them you use correctly.

CAFE standards	Pesticide manufacturers and pesticide dealers
cap and trade	six-cent tax on plastic bags
Chicago Climate Exchange	subsidies
combination of tools	sulfur dioxide emissions
command and control policies	Sweden raised taxes on carbon and sulfur emissions
Danish pay higher taxes on their cars	tax credits
eco-industrial parks	tax shifting
emissions trading systems (ETS)	taxed almost every source of energy
encourage industries to make “green” products	taxes fertilizers
free-market economy	Title IV of the Clean Air Act
global climate change	voluntary carbon trade market
Groundwater Protection Act	waste
Partnership for a New Generation of Vehicles (PNGV)	

Alternative Unit Assessment Master | page 2 of 3

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Alternative Unit Assessment Master | page 3 of 3

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Key Unit Vocabulary

Lesson 1 Activity Master | page 1 of 2

Additionality: A condition for a project to qualify as a Clean Development Mechanism (CDM) that requires proof that the project would not otherwise be built without the incentive of the sale of credits.

Biomass: Plant material (wood, grains, agricultural waste, vegetation) that can be used as an energy source.

Carbon dioxide: A colorless gas that is a by-product of respiration and combustion, and is absorbed by vegetation.

Carbon monoxide: A colorless highly poisonous gas and a by-product of combustion.

Carbon sink: A carbon reservoir that takes up more carbon than it is giving off or emitting.

Clean development mechanism (CDM):
A mechanism that issues emission reduction credits to projects that reduce carbon emissions, such as the building of a solar power plant. Under the CDM project activities not covered by the cap are given emission reduction credits to sell to companies that are not in compliance with the cap.

Command and control policies:
Government regulations that limit and/or prohibit certain practices. An example is banning the pesticide DDT.

Crop rotation: Varying the crops on a piece of land in a planned series, to save or increase the mineral or organic content of the soil, increase crop yields, and control or lessen insects and plant diseases.

Eco-industrial parks/resource recovery parks:
Business locations where member businesses work together to manage environmental and resource issues to yield cleaner production and energy efficiency, reduce or prevent pollution, and remain economically viable.

Ecosystem services: The functions and processes that take place in natural systems, such as pollination, that support or produce goods and help sustain human life, economies, and cultures.

Emission allowances: A permit to emit a unit of emission. Regulators give emission allowances equal to the cap to polluters who can sell or trade surplus allowances.

Emissions: The release of substances such as gases or particulates that contribute to air pollution. Other forms of emissions include noise, vibrations, light, heat, radiation, and odors.

Emissions trading/cap and trade: A regulatory tool that utilizes market systems to achieve an environmental goal. The government establishes a standard of acceptable pollution (a cap) but allows companies to trade pollution allowances to comply with the law.

E-waste: Unwanted electronic devices such as old cell phones and outdated computers that contain hazardous wastes such as lead and mercury.

Excise tax: A tax on specific products intended to discourage the use of those products, often applied to cigarettes and alcoholic beverages. Some excise taxes may be levied to generate revenue.

Fiscal policy: An economic policy of the federal government that involves the use of taxes and spending to make adjustments in the economy.

Global climate change: A long-term significant change in the weather patterns of Earth.

Landfill: A type of solid waste disposal in which garbage is buried between layers of dirt.

Mercury: A highly toxic metal that is liquid at room temperature and has many industrial uses.

Key Unit Vocabulary

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Natural resources: Materials and material capacities supplied by natural systems and used by humans (for example, forests, water, and energy reserves).

Natural systems: The interacting and/or interdependent components, processes, cycles, and interactions among organisms and their habitats.

Negative externalities: Undesirable effects on others that are not accounted for by the polluter, such as air pollution.

Offset: The interacting and/or interdependent components, processes, cycles, and interactions among organisms and their habitats.

Opportunity cost: The foregone economic benefit from the next best action to be taken.

Public policy: A government plan or course of action.

Regulation: A rule created by a government agency or other legislative authority to implement and enforce laws and policies.

Subsidy: Government funds given to support an enterprise that is considered beneficial to the public.

Symbiosis: A relationship of mutual benefit or dependence.

Tax credit: A reduction in taxes or applying money spent as credit toward taxes owed.

Tax shifting: A tax policy that eliminates or reduces one or more taxes and establishes or increases other taxes such that the overall revenue is the same.

User fees: A charge for the use of a publicly owned or operated facility, such as a national park.

Zero emission vehicle (ZEV): A vehicle that does not emit emissions or pollutants, such as an electric car or car powered by a hydrogen fuel cell.

E-Waste and Eco-Industrial Zones



While the term “e-waste” might make you think of junk email clogging your inbox, the term actually applies to unwanted electronic devices such as old cell phones and outdated computers. Not all electronic devices are e-waste, only those that contain toxic materials.

When discarded, these pieces of equipment may leach toxins into the environment and are part of a whole new category of government-regulated hazardous waste, called “electronic waste.” Technology is such a part of our everyday lives that we can’t remember life without cell phones and computers. But what happens to all these electronic wonders when they “die” or become obsolete?

On average, cell phones are owned for less than 18 months, and the typical computer is outdated within 3 to 5 years. By 2005, an estimated 63 million personal computers were “retired” throughout the nation. Most went into storage, and fewer than 6% were reused or recycled. Some clever consumers find interesting uses for parts of old laptop and desktop computers, but most of the components of these devices were, until very recently just

thrown away, creating two million tons of toxic trash as a result.

Our creation and use of technology has created a paradox. All the new technologies help us save time and money, but they generate waste that, if mismanaged, can be hazardous to humans and other living things. E-waste often contains toxic materials, such as lead, mercury, and other heavy metals. The rapid turnover of cell phones means that almost 2 million are discarded each week, creating 65,000 tons of toxic waste each year. A typical 17" computer monitor's cathode ray tube (CRT) can contain over 2 pounds of lead, and a 27" TV screen over 8 pounds of lead.

Lead released from mismanaged e-waste is of particular concern because this heavy metal is a toxin that affects the human brain. When lead breaks down in the environment, it can create lead oxide dust.



Cell phone

When a significant amount of lead dust is absorbed by the body through the lungs or stomach, it affects the nervous system. Too much lead can result in learning problems and fatigue as well as damaging other internal organs. Young children are at higher risk for lead poisoning because

their bodies absorb lead more readily than adults, and because they tend to put everything in their mouths.

In 2003, the State of California enacted landmark legislation: the Electronic Waste Recycling Act. This law was intended to offset the cost of diverting e-waste from inappropriate disposal toward responsible recycling.

This law allows the government to use monetary incentives to encourage the responsible collection and recycling of certain electronic products. Electronic devices covered by the law include TVs and computer monitors with CRTs, liquid crystal display (LCD) screens, plasma televisions, and portable DVD players with LCD screens. Retailers collect a recycling fee from consumers, on behalf of the government, when the specified electronic devices are sold. The government then distributes these funds to qualified recycling operations that salvage useful materials from covered e-waste. This law removes the cost barrier that could prevent the public from properly recycling unwanted electronics.

This electronic waste recycling fee may sound similar to the “California Redemption Value” (CRV) you pay at a store when purchasing drinks in glass, plastic, or aluminum containers,



Plasma televisions

but in this case there is no redemption value and consumers are not entitled to a refund when they recycle their old devices.

In addition to establishing an e-waste recycling system, the Electronic Waste Recycling Act requires manufacturers to reduce hazardous substances in certain electronics they sell to consumers if they want to do business in California.

Eco-Challenges Bring Economic Opportunities

In this millennium, our government is working hard to get businesses and consumers to think about the consequences of consuming goods that rapidly become obsolete and require proper disposal and/or recycling. Convincing businesses, in

particular, that “going green” can earn good will as well as saving money is not easy, but this is changing as many companies find that thinking “green” is good for the “bottom line.” Some businesses have cashed in.

In the early 1990s, a California think-tank introduced the idea of “eco-industrial parks.” The concept is simple. A variety of businesses, operating on a common property, often with one large “anchor” company, combine forces to reduce waste and increase efficiency. The businesses share resources: materials, building, water, energy, information, administrative costs, and space. As the concept evolved, some projects focused on co-locating companies that can use each



E-waste

other's wastes. This means that the wastes produced or processed by one business can be used as a feed stock by another nearby business to create new products. For example, one company's waste tires might be used by another company to create shredded or crumb rubber for new products like rubber mats or road paving materials. This kind of business model is often called a "resource recovery park" or an "eco-industrial park." The terms are often used interchangeably, however, resource recovery parks more typically include of a collection of businesses that are focused on the reuse or recycling of materials (including such operations as composting facilities), and where people

can take their used and waste materials to be processed or handled.

Whatever the name, the goal is simple: to get as close as possible to creating a zero-waste system.

One of the first and finest examples of a natural symbiosis between businesses is located in the city of Kalundborg, Denmark. This unique collaboration developed in the 1970s as businesses began to realize that the exchange of materials and wastes could increase efficiency and conserve resources. In Kalundborg, a refinery, a power station, and a pharmaceutical plant are at the hub of the resource exchange web. At the periphery are farms, a road paving company, and the

city of Kalundborg's residential and municipal facilities.

The symbiosis started with energy flows, followed by material flows. A manufacturing plant recognized the nearby refinery's gas flares as a potential fuel source—the refinery was burning off byproduct gases. The material flows include sludge from a manufacturing plant and the water treatment plant for a fish farm: a nearby farm uses the sludge as fertilizer. Another nearby farm uses surplus yeast from an insulin manufacturing plant as pig food. A cement company uses the power plant's left over ash. Another company buys liquid sulfur from the refinery, which had to install a sulfur recovery operation

to comply with emissions regulations. In other words, each company benefits from the others, a true symbiosis.

Today, eco-industrial developers understand that businesses do not necessarily need to be located on the same property. The resource matrix within a regional zone reduces greenhouse gases associated with transportation and promotes sustainable businesses that consume waste materials—what is important is facilitating these connections. So far, about two dozen eco-industrial zones have been created in the United States, but the concept is still new, and the future seems bright for creating many more eco-industrial zones.

One of the best examples of a modern resource recovery park in the United States is a collective located in southern California, on the Cabazon Indian Reservation outside Palm Springs. A variety of environmental and waste management firms work together and use almost 600 acres of the reservation. These firms include a biomass power plant and a tire recycling company. The power plant supplies electricity to 45,000 homes in Southern California by burning wood products, such as yard, construction, and demolition waste. The tire recycling

company turns 6,000 pounds of used tires per hour into crumb rubber, used to pave roads, playground surfaces, and equestrian arenas.

State and federal grants from the U.S. Environmental Protection Agency and the U.S. Departments of Commerce, Energy, and Housing and Urban Development are sometimes available to provide the “seed” money to begin the collaboration and planning for an eco-industrial park. Other sources of financing include environmental groups, banks, and socially responsible investment funds. State and local agencies and

community organizations often act as “connectors” and consultants to bring the businesses together. In some states, low-interest loans are provided and permitting fees are reduced. The government and industry collaboration to reduce waste of all kinds, including e-waste, is good for the local economy and helps reduce the carbon footprint of local industries and consumers.

While globalization has brought distant economies closer together, the future may also favor localization when it leads to increased efficiency and sustainability.



Tire recycling

New Types of Waste; New Solutions to Handling Waste

Lesson 1 Activity Master | page 1 of 3

Name: _____

Write a sentence that answers each of the questions below.

1. What is e-waste? Provide two examples. (3 points)

2. What makes e-waste dangerous? Name two hazardous materials used in constructing electronics. (3 points)

3. How might these hazardous waste products cause health problems if they end up in a landfill? (1 point)

4. How does the Electronic Waste Recycling Act work to encourage recycling? (1 point)

- a. How does the government participate in e-cycling? (1 point)

- b. How do store owners participate in e-cycling? (1 point)

New Types of Waste; New Solutions to Handling Waste

Lesson 1 Activity Master | page 2 of 3

Name: _____

c. How do consumers participate in e-cycling? (1 point)

5. What is the goal of a resource recovery park? (1 point)

6. What is an eco-industrial park? (1 point)

7. What are three examples of symbiosis in the Denmark example of how one business's negative externalities become positive externalities? (3 points)

8. What is one recycling idea used in Cabazon? (1 point)

9. What are three examples of the government encouraging the development of e-cycling and eco-industrial zones? (3 points)

New Types of Waste; New Solutions to Handling Waste

Lesson 1 Activity Master | page 3 of 3

Name: _____

10. Do you think businesses would participate in e-cycling without government action?
Why or why not? (2 points)

Case Study: Zero Emissions Vehicle (ZEV) Regulations

Traffic is one of the main sources of air pollution. Pollutant levels can be correlated with distance from freeways. High concentrations of regulated air pollutants such as nitrogen oxides and contaminants from gasoline and fuel combustion are found within close proximity of freeways. Concentrations of ultrafine particles significantly above those which occur naturally are found within 500 feet (152.4 meters) of freeways; and, pollutants that have adverse effects on health have been identified up to 5,000 feet (1524 meters) from freeways. Health effects associated with traffic pollutants include respiratory and heart diseases.

Air quality in some parts of California, for example, the South Coast and San Joaquin Valley, is among the worst in the nation. California has been working on reducing pollution in the state since 1947 when the Los Angeles County Air Pollution Control District (LCAPCD) was created. Since that time, Los Angeles County set into motion laws that banned use of backyard incinerators and citrus grove smudge pots. The county even made regulations concerning backyard barbecues. The state also required auto manufacturers to use catalytic converters in 1975, which helped to convert carbon monoxide into carbon dioxide. In spite of all the efforts, in 2008 the city of Los Angeles ranked as the #1 most polluted city in the country. The U.S. EPA identifies motor vehicles as the

most common sources of air pollution in the U.S.

In 1990 the California Air Resources Board (CARB) implemented the Zero Emissions Vehicle (ZEV) program. The new program required automotive companies doing business in California to sell a certain number of cars that produced no exhaust ZEVs. This meant electric cars and hydrogen fuel cell cars. The law was to be implemented in stages. By 1998, 2% of all cars sold in California were supposed to be zero emissions, and by 2003, 10% had to be zero emissions.

In 1996, however, the auto industry objected to the law's requirements, saying that the battery technology was not yet good enough. CARB responded by eliminating the 1998 2% goal, but kept the 2003 10% goal in place. It also decided to allow for

low emissions cars like electric hybrids to count toward the goal.

In 1996, the auto manufacturers began leasing electric cars. The cars needed to be recharged after short distances (about 60 miles), they were expensive (starting at about \$32,000), and they were only available for lease. Despite these limitations, CARB reported in 2004 that "consumers quickly bought these highly functional vehicles and called for more." In 2003, however, the automotive manufacturers stopped producing electric cars. GM said it was unable to supply the parts to repair the cars, and would not renew leases on the cars already on the road. The company said it intended to send some of the cars to museums, universities, and research labs, while scrapping the others. At about the same

Case Study: Zero Emissions Vehicle (ZEV) Regulations

Lesson 2 Activity Master | page 2 of 2

time, the auto companies sued the state of California over the ZEV law. The Bush Administration joined in the suit against the state of California. The lawsuit was dismissed when the Air Resources Board agreed to revise its standards in ways that eased requirements for auto makers to get credit toward compliance with the ZEV program.

As of 2008, the state has made many changes to the original Zero Emissions Vehicle law. A point system allows for more flexibility in compliance. Manufacturers get credits for producing automobiles that are partial zero emissions vehicles (PZEV) and they get points for development of new technology ZEV cars such as hydrogen fuel cell cars. There are three rankings for car emissions that qualify for points: The gold level is for cars that are zero emissions, such as electric cars and hydrogen fuel cell cars. The silver level includes hybrid cars and plug-in-hybrids. The bronze level is for vehicles that rely on internal combustion engines but use technologies such as electric drives, battery storage and regenerative braking, and compressed natural gas to reduce emissions. The fact that the modified ZEV law is more flexible, combined with market pressures such as high gas prices, makes the ZEV

regulations more acceptable to the auto industry. In addition, California has received a waiver from the federal government, allowing it to modify federal emission standards towards greater strictness.

Auto makers have given several reasons for opposing the ZEV standards. First, they report that the technology is too limited to make the cars practical. Even as late as 2008, battery technology is limited. Mitsubishi Motors estimates their Neighborhood Electric Vehicle (NEV) called “iMiEV” now in development, will get 100 miles to the charge while Tesla motors estimates that their Roadster will get from 220 to 260 miles to the charge. Manufacturers have also claimed that consumers

were not interested in electric cars because of their limitations and high cost. A final reason is profitability. In recent years, car companies have not been making a reasonable profit from car sales. Instead, most of their profits come from maintenance and selling parts for car repairs. The electric car has fewer parts and very little maintenance. This could mean billions of dollars of lost profits for car companies and service centers.

In 2008, the federal government authorized \$25 billion dollars for the Big Three (Ford, GM, and Chrysler) to retool their factories for making more fuel-efficient cars. The car companies have asked for another \$25 billion dollars in loans to prevent the industry from going bankrupt.



Hydrogen fuel cell car

Case Study: The *Exxon Valdez*

In the cold waters off of Prince William Sound, Alaska, on the night of March 24, 1989, the oil tanker *Exxon Valdez* ran into Bligh Reef and spilled 10.8 million gallons of crude oil. Oil covered 11,000 square miles of ocean and killed more wildlife than any other human-caused disaster ever. The remoteness of the region and the amount of oil spilled made the cleanup a nightmarish task. Even today, the environment and the economy of Prince William Sound continue to suffer. The fishing industry in the area has not recovered and the tourist industry has also declined since the spill. The costs to local residents and the natural environment have been high.

The following three statements from victims of the disaster show the high cost paid by the people living near the spill, as well as the environmental damage it caused.

“Among the tragedies from the spill is that the Alutiiq people cannot rely with confidence on the subsistence natural resources that have sustained us for millennia. We have lived in Prince William Sound and around Kodiak for over 7,000 years without damaging our homeland or its natural resources. But, because of the Exxon oil spill, we have lost something that is beyond compensation. We have lost an intergenerational bond that defines our people as one of the world’s distinct cultures. Can this ever be restored?”

—Sven Haakanson, Jr., Alutiiq Native, 20-year commercial fisherman, Ph.D, Anthropology, Harvard University, Director, Alutiiq Museum, Kodiak, Alaska, 2007 MacArthur Foundation Award Recipient, February, 2008.

“My husband and I are commercial fishermen. He has been fishing since he was a boy of six. That’s just the way it was in coastal villages. When the Exxon supertanker hit the rocks, it stopped us from doing what we live for. We own Prince William Sound fishing rights in the area most heavily oiled and we have not been able to fish there since the spill. In the aftermath of the spill, the monetary value of our rights there fell by ninety-eight percent, not to mention the total loss of fishing income. We’ve fished other areas but have not had an income from the Prince William Sound fishery for 16 years because of the crash in the herring stocks... [T]he ship that left Valdez on that dreadful day had a captain known to Exxon to be a relapsed alcoholic, who was reportedly drunk and yet they still let him command the tanker that night. The spill was therefore foreseeable and completely avoidable but for Exxon’s recklessness.”

—Linda Suydam, Alutiiq Native, Longtime Commercial Fisherwoman, Mother of a Fisherman, February, 2008.

Case Study: The Exxon Valdez

Lesson 2 Activity Master | page 2 of 3

“... the City of Cordova, Alaska is... the economic and emotional ground zero of the 1989 Exxon Valdez oil spill... [T]he fisheries in Prince William Sound had to be closed because of the oil spill causing numerous business and personal bankruptcies from which the community has not... recovered... [T]he Cordova Chamber of Commerce reflects upon the 1989 spill and its 19th Anniversary with concern and anger that remedial steps to equitably and responsibly move toward closure through respecting the judgment of the Federal District and Appellate Courts by Exxon-Mobil have been frustrated at every turn because of the apparent preoccupation of Exxon-Mobil only for its ability to maximize its profits... [T]he Chamber... conveys to the public and to Exxon Mobil, its officers, directors and shareholders the Chamber’s disgust at the uncaring attitude for the harm Exxon’s actions caused... and the morally deficient way that Exxon Mobil as a corporation has conducted itself in doing all it can to avoid responsibility...”

—Cordova, Alaska Chamber of Commerce, February, 2008.
(From remembertheexxonvaldez.com)



Exxon Valdez spill

The economic costs of the accident have also been high for Exxon. Exxon has paid nearly \$3.4 billion dollars for cleanup, fines, and as legal settlements with seven fisheries. In addition, local residents sued Exxon. In 1994, they won \$87 million plus \$5 billion in punitive damages. On appeal, however, punitive damages were reduced to \$2.5 billion. In 2008, the Supreme Court reduced them again to \$507 million. Since Exxon had made a previous settlement with the seven fisheries, the ruling allowed Exxon to pay itself back with part of the final settlement. So \$54 million of the \$507 million went directly to Exxon. After attorneys’ fees, the remaining money was distributed to about 30,000 people who were affected by the oil spill.

Case Study: The *Exxon Valdez*

Lesson 2 Activity Master | page 3 of 3



Exxon Valdez cleanup

The *Exxon Valdez* was certainly not the first oil tanker accident in history. Oil tanker accidents prior to the Valdez led to several attempts to pass laws that would have limited the damage caused by future accidents. In 1976, Alaska passed a law that required oil tanker ships to have a two-layered hull that would better withstand collisions than a single hull. Oil companies challenged the law in court, presumably because the cost of re-outfitting their ships would be high and might hurt profits, at least in the short-term. The law was thrown out in 1978. The Nixon Administration promised that double-hulled ships

would be required for the fleet servicing the Alaska pipeline, but Congress never passed a law requiring such ships. Washington Senator Warren Magnuson's 1975 bill requiring only "double-bottomed" ships, and President Jimmy Carter's directive to the Coast Guard to require double-bottomed ships both failed to pass. If the *Exxon Valdez* had been a double-hulled ship, most experts agree that the tanker might have spilled 60% less oil than it did—if it spilled any at all. The difficulty passing a law that would require double-bottomed ships is a clear-cut example of business's profit motive conflicting with environmental protection.

Some argue that if Exxon had lost \$2.5 billion dollars in the lawsuit, the corporation would raise the price of oil to make up the loss. If Exxon could raise its price then it would be Exxon consumers who would bear some, if not all, of the burden of the penalty and thus directly pay for the damages created by their consumption. The *Exxon Valdez* case, then, raises difficult questions about who actually pays for environmental damage when the government steps in to protect the health of people, animals, plants, and habitats. In theory, the polluting companies pay. In reality, consumers may actually foot the bill.

The Challenges of Environmental Laws

Lesson 2 Activity Master | page 1 of 4

Name: _____

Zero Emission Vehicles (ZEV) Regulations

1. What board was created in 1947? What was its purpose?

2. What are two examples of activities that were restricted in Los Angeles County to limit air pollution?

3. What does the U.S. EPA identify as the most common source of air pollution in the United States?

4. What program did the California Air Resources Board (CARB) start in 1990?

5. What did the program do?

6. Were any cars produced that met the requirements?

The Challenges of Environmental Laws

Lesson 2 Activity Master | page 2 of 4

Name: _____

7. What happened to those cars?

8. What happened to the law in 2003?

9. What two reasons did the auto companies give for opposing the manufacturing of these cars?

Exxon Valdez

1. What happened near Prince William Sound on the March 24, 1989?

2. What two parts of the region's economy have been severely affected?

The Challenges of Environmental Laws

Lesson 2 Activity Master | page 3 of 4

Name: _____

3. How did the spill affect the native people who lived near Prince William Sound?

4. How did the spill affect people who fish for a living and rely on the Sound for their livelihood?

5. Who do people who fish for a living blame for the accident?

6. What did the Chamber of Commerce of Cordova, Alaska say about the spill?

7. a. In the lawsuit against the company, how much was awarded in damages and punitive damages?

b. What happened to the damages when Exxon appealed the case and then again when the case went to the Supreme Court?

The Challenges of Environmental Laws

Lesson 2 Activity Master | *page 4 of 4*

Name: _____

8. From Exxon's point of view who would have suffered from paying the cost of the punitive damages?

9. Who might actually have paid the cost of the damages?

Environmental Laws and the Economy

Lesson 2 Activity Master | page 1 of 2

Name: _____

The *Exxon Valdez*

1. How did the oil spill affect Alaska's economy? (1 point)

2. How did the oil spill affect Exxon? (1 point)

3. What role did government regulations play in the *Exxon Valdez* case? (2 points)

4. What role did the courts play? (2 points)

5. a. How could Exxon get the money to pay its penalties? (2 points)

- b. How might market competition prevent such an outcome? (2 points)

The ZEV

1. How would the ZEV program benefit the people of California? (1 point)

Environmental Laws and the Economy

Lesson 2 Activity Master | page 2 of 2

Name: _____

2. Who opposed the law? Why? (2 points)

3. How did the state government change the law between 2003 and 2008? (2 points)

4. What were the opportunity costs of California modifying the law? (1 point)

5. If ZEV laws were applied to all auto companies doing business in the United States, how would they affect the competitiveness of the companies? (1 point)

6. How might the automakers have benefited from the law if they had not fought it so hard? (1 point)

7. In your opinion, supported by facts, why did the auto companies fight so hard to get the law changed? What had to be changed in the law to make it acceptable to them? (2 points)

Zero Emission Vehicle (ZEV)



Exxon Valdez Oil Spill



Case Study: Environmental Tax Shifting (ETS)

One popular way to reduce the number of young smokers has been for states to increase taxes on a pack of cigarettes. This kind of tax is called an excise tax. On average, states have moved cigarette taxes up to \$1.18 a pack and they have found that every 10 percent increase in the cost causes a seven percent decline in use. Some countries and states are coming to the conclusion that this same idea can discourage environmentally detrimental behavior.

Governments frequently use taxes to discourage behavior. A tax on plastic shopping bags in Ireland reduced use of the bags by 90 percent. Plastic bags were littering beaches and killing marine life, and they are considered non-biodegradable. The tax made the price of plastic bags so high that stores encouraged the use of reusable cloth bags. Some California cities are considering doing the same thing. San Francisco and Oakland have banned plastic bags, and other cities such as Santa Monica are attempting to ban them. California cities are not allowed to tax plastic bags, but California AB 2058 proposed that large retailers be required to charge a 15-cent fee for plastic bags. A bag tax would likely lead to decreased plastic-bag use, and plastics- and plastic-bag makers opposed it. Their need for profit conflicts with environmental health.

Governments taxing items like plastic bags is called tax shifting, because it shifts the burden of paying taxes away from one group—income-tax payers—to another—companies and individuals that pollute or use polluting items. Germany is perhaps the leader in tax shifting. The German government has taxed almost every source of energy to discourage overuse, and it has been able to shift tax revenue away from wages by 2.1 percent. Sweden raised taxes on carbon and sulfur emissions and shifted revenue away from

income tax by 1.9%. Setubal, a city in Spain, allows 0.7 cubic meters (25 cubic feet) of water to each home without tax, but taxes every meter (35.3 cubic feet) after that. The Danish, who according to research are the world's happiest people, pay as high or higher taxes on their cars than they pay for the cars themselves. They also pay taxes on landfill use.



Path littered with plastic bags

Case Study: Environmental Tax Shifting (ETS)

Lesson 3 Activity Master | page 2 of 2

In the United States, there are some cases where taxes are being used to discourage the use of certain products. The 1987 Iowa Groundwater Protection Act, for example, charges registration fees to pesticide manufacturers and pesticide dealers, and the law taxes fertilizers. Nebraska also taxes fertilizer and uses the revenue to support the Natural Resources Enhancement Fund.

Tax laws can work in the other direction, too, by favoring the economic well-being of certain industries over the well being of the environment. Mining companies, for example, get a “percentage depletion allowance,” which is a tax break for the depreciated value of their mines. The purpose of the tax break is to help mining companies recover some of the high cost of mining. Opposing the allowance, Senator Russell Feingold of Wisconsin proposed a bill to repeal it. The bill claimed that the tax policy provides “double subsidies for the hardrock mining industry.” In contrast, the United Kingdom cut its coal mining by 50 percent by cutting subsidies to the mining industry.

By using tax breaks and excise taxes—fiscal policies—the government can influence the behavior of both producers and consumers.



Coal mine

Case Study: Partnership for a New Generation of Vehicles (PNVG)

In the 1990s General Motors (GM) developed a prototype car called the Precept, a diesel hybrid with a rating of 80 miles per gallon (MPG). Ford developed the Prodigy, which was able to get 72 MPG, and Chrysler developed the EXS-3, which could get 70 MPG. The automakers developed these prototypes as part of a federal program called The Partnership for a New Generation of Vehicles (PNGV).

The program began in 1993 as collaboration between the federal government and the Big Three automakers (General Motors, Ford, and Chrysler). Its aim was to use the know-how and resources of eight government agencies (Departments of Commerce, Energy, Defense, Interior and Transportation, the National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), and the Environmental Protection Agency) to develop fuel-saving technologies. To that end, the federal government invested \$1.5 billion dollars. Armed with the new technology, the Big Three were able to build the prototypes. Some great innovations resulted from the partnership. These included the following:

- A carbon coating that is better than Teflon, and carbon foam that could be used as a lightweight radiator or to cool brakes or fuel cells
- A device that converts gas to hydrogen, for use in fuel cell technology
- Cleaner diesel technology
- Hybrid technology and fuel cell technology
- Lighter, cheaper high-tech aluminum, magnesium and fiberglass
- Automotive weight-reduction for better mileage



PNGV logo

Case Study: Partnership for a New Generation of Vehicles (PNVG)

Lesson 3 Activity Master | page 2 of 2



Hybrid car

Despite all these accomplishments, the PNGV program had many critics. Some environmentalists argued that the program did not set Corporate Average Fuel Economy (CAFE) standards, so automakers were not required to increase mileage. Further, they said that PNGV did not require automakers to use the technology they developed. Some politicians also criticized the program, arguing that auto makers did not need federal assistance to research new technologies, and that taxpayer money could be better spent elsewhere. Others criticized the program because no incentives were created to encourage the adoption of the technology.

In 2001 the program ended and the automotive companies walked away from the technology. None of the three new cars—the Precept, Prodigy, or EXS-3—has been manufactured for sale since then. When Ford Motor Company decided to produce a hybrid in 2004, it bought

a license from Toyota rather than use the technology developed under PNGV.

In 2002, the Bush Administration began the Freedom CAR (Cooperative Automotive Research) program. While the new program resembled PNGV in some ways, it focused specifically on developing hydrogen fuel technology. Like PNGV, Freedom CAR emphasizes collaboration between government and industry. Like PNGV, Freedom Car has its critics, too. Critics say the technology will not be practical for another 15 to 20 years. Further, they argue, hydrogen fuel is expensive and currently derived from petroleum, meaning this program won't help the United States end its dependence on foreign oil. Finally, the Freedom CAR program also requires no CAFE standard changes, nor does it require the automotive companies to use the technologies that would be created under the program.

Fiscal Policy Tools Comparison

Lesson 3 Activity Master

Name: _____

Directions: Fill in the following chart as you read and discuss the three case studies.

Case Study	Program Description	Type of Program	Problems with Program
Partnership for a New Generation of Vehicles			
Environmental Tax Shifting (ETS)			

Lesson 3 Activity Master | page 1 of 2

Write a one-paragraph response to each of the following sets of questions.

1. What type of fiscal policy is Partnership for a New Generation of Vehicles (PNGV) an example of? Using PNGV as an example, what are the benefits of this type of fiscal policy? What are the limitations? How did PNGV affect the market? How effective was PNGV? (10 points)

This image shows a single page of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins or other markings present.

Lesson 3 Activity Master | page 2 of 2

2. What type of fiscal policy is Environmental Tax Shifting (ETS) an example of? Using plastic bags as an example, what are the benefits of this type of fiscal policy? What are the limitations? How does/did the policy affect the market? How effective has ETS been? (10 points)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Fiscal Policy Tools Comparison

Case Study	Program Description	Type of Program	Problems with Program
Partnership for a New Generation of Vehicles			
Environmental Tax Shifting (ETS)			

Scenario #1

Americans rely on modern chemistry for everyday products. Chemistry helps produce everything from cleansers for the bathroom to the plastics that make toys, car parts, and even paint. Manufacturers produce a lot of toxic waste (negative externalities) in making these products. When consumers use cleansers, they go down the drain and can end up in rivers or the groundwater. The solids, such as plastics, take years to break down, and they often end up in landfills. When they end up in oceans and rivers, wildlife may get caught in them or eat them.

What would be the best approach to eliminating these problems, since people are not going to stop using these products as long as they need cleansers, paints, and plastics?

Scenario #2

Traditional farming practices involve rotating crops and planting a diversity of crops. Crop rotation keeps the soil healthy, and a diversified crop prevents one disaster from destroying an entire farm. For example, a particular insect may target corn, but not tomatoes, or a late rain may hurt wheat or grapes but not corn. However, in the modern economy, farming has become large-scale and in the interests of economic survival, many farmers have abandoned traditional methods. Some large-scale farmers may grow one crop rather than many crops because then they can buy or rent one kind of harvesting machine and harvest the whole crop at once. When farmers grow the same crop year after year, they are not able to rotate crops and the soil can become depleted. To compensate, they use chemical fertilizers that can damage the soil and leech into the rivers and groundwater, which provide drinking water. They may also spray pesticides to prevent insects from destroying crops. Pesticides can cause birth defects, lung ailments, and other health problems. Pesticides may also spread beyond the farm crops into the environment.

What can be done to decrease the damage caused by farming practices that rely on chemistry?

Scenario #3

Farmers need honey bees to pollinate their crops so that plants can reproduce. Many wild plants also rely on bees for pollination. Over the past decade, bees have begun disappearing and no one knows why. There are currently many theories about the cause. Some suggest global climate change is causing environmental changes that make bees more susceptible to diseases. Others say that a bacteria is getting into bee hives and killing bees. There is also some evidence suggesting that varroa mites are killing the bees. Yet another hypothesis is that the nicotine-based pesticides many farmers have been using is killing bees. Because bees are essential to plant reproduction, scientists say that if the bees disappear, crop production will drop dramatically with many ramifications to agriculture and economic systems.

What can be done about this problem? Should the government wait until the cause is known for certain before acting?

Scenario #4

A practical approach to reducing the pollution created by power plants is to reduce electricity use. Since 9% of our electrical use is lighting, compact florescent light bulbs (CFL) have become very popular. CFLs use approximately one-fifth of the electricity of a standard incandescent bulb, so the savings on electricity and money can be dramatic. The problem is that CFLs use mercury, a highly toxic liquid metal, to produce light. Once these bulbs burn out, some may end up in a landfill where they can break and release the mercury into the soil. The mercury can eventually contaminate the groundwater. As more and more people use CFLs, the energy-efficient bulbs raise environmental concerns.

What is the best way to deal with the fact that CFL bulbs contain mercury that can damage human and environmental health?

Applying Fiscal Policy to Environmental Decisions

Lesson 4 Activity Master | page 1 of 5

Name: _____

Directions: Read three scenarios and discuss possible solutions in groups. Write your group's answer for each problem, your proposed solution, and possible problems with the solution. (20 points maximum for each scenario)

Applying Fiscal Policy to Environmental Decisions Scoring Tool

	10 points for each item	8 points for each item	4 points for each item	4 points for each item
Policy Tool and Response to Problem	Identifies a correct policy tool and uses facts from the scenarios to respond to the problem thoroughly.	Identifies a correct policy tool and uses facts from the scenarios to respond to the problem appropriately.	Identifies a correct policy tool and demonstrates understanding of the problem by stating a plausible solution.	Identifies a proper policy, but does not respond to the problem appropriately.
Depth of Understanding	Demonstrates a strong understanding of the subject.	Demonstrates an understanding of the subject.	Demonstrates minimal understanding of the subject.	Demonstrates no understanding of the subject.
Written Response and Scenarios	Response has good depth, and clearly states and supports the proposal with information from the scenarios.	Response has some depth, and states and supports the proposal with some information from the scenarios.	Response minimal, and only supports the proposal with limited information from the scenarios.	Writing shows little thought and does not demonstrate an understanding of the proposed solution. Minimal written response.

Applying Fiscal Policy to Environmental Decisions

Lesson 4 Activity Master | page 2 of 5

Name: _____

Scenario #1

State problem: _____

What would be the best approach to eliminate this problem?

Proposed solution and rationale: _____

Possible problems with proposal: _____

Applying Fiscal Policy to Environmental Decisions

Lesson 4 Activity Master | page 3 of 5

Name: _____

Scenario #2

State problem: _____

What would be the best approach to eliminate this problem?

Proposed Solution and rationale: _____

Possible problems with proposal: _____

Applying Fiscal Policy to Environmental Decisions

Lesson 4 Activity Master | page 4 of 5

Name: _____

Scenario #3

State problem: _____

What would be the best approach to eliminate this problem?

Proposed Solution and rationale: _____

Possible problems with proposal: _____

Applying Fiscal Policy to Environmental Decisions

Lesson 4 Activity Master | page 5 of 5

Name: _____

Scenario #4

State problem: _____

What would be the best approach to eliminate this problem?

Proposed Solution and rationale: _____

Possible problems with proposal: _____

Emissions Allowances and Environmental Protection

Lesson 5 Activity Master | page 1 of 8

Name: _____

Slide 2

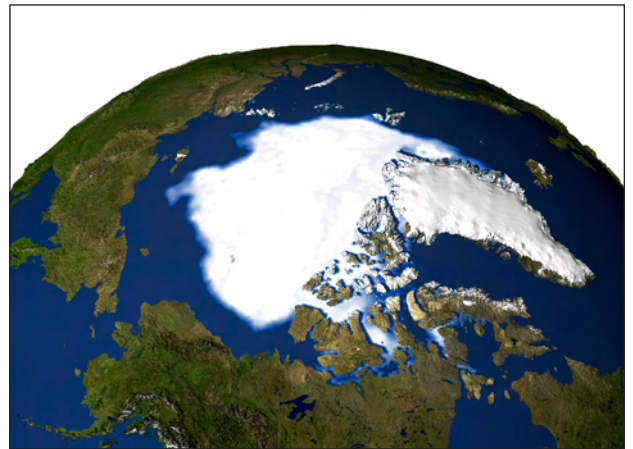
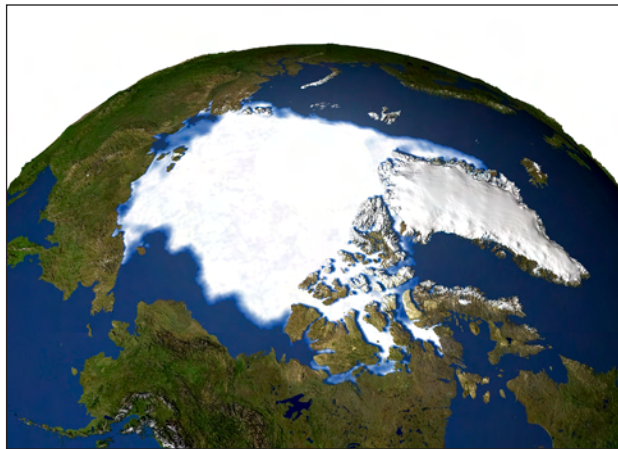
This is a photograph of downtown Los Angeles on a smoggy day.

What economic and health problems arise from this situation?



Slide 3

These satellite photos compare the ice coverage area of the arctic region from 1970 to 2008.



These pictures indicate there is a reduction in the ice coverage in the arctic region. What might be some of the consequences of this change?

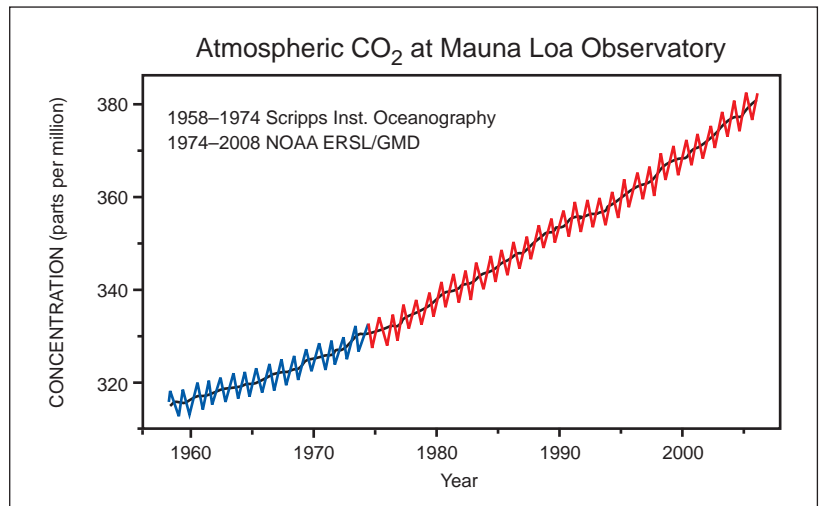
Name: _____

Slide 4

This graph shows carbon dioxide emissions from 1960–2000. What do you notice about the emissions?

This is important because carbon emissions are considered the primary cause of climate change.

Currently, carbon increases can be traced to human consumption of coal-powered electricity, use of automobiles, and other sources.



With almost seven billion people living and consuming Earth's resources, it should not be surprising that human behaviors affect the planet.

Slide 5

What makes global climate change an economic problem?

What are some possible solutions to this problem? What would you recommend?

Emissions Allowances and Environmental Protection

Lesson 5 Activity Master | page 3 of 8

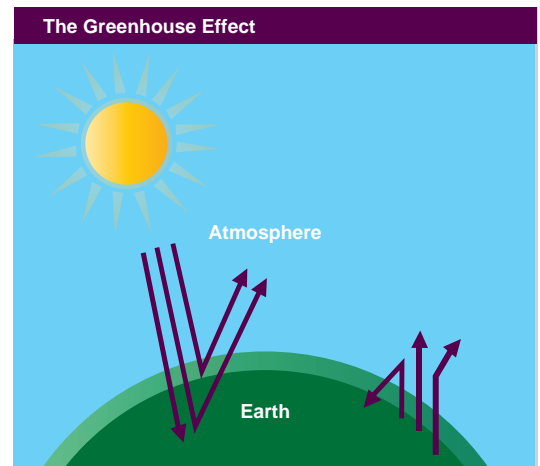
Name: _____

Slide 6

When solar radiation gets to Earth some of it passes through the atmosphere and is absorbed by Earth and some is reflected out into space.

The atmosphere contains greenhouse gases such as water vapor, carbon dioxide, and methane. Increases in greenhouse gases cause the atmosphere to absorb more energy.

When the heat from Earth's surface rises, greenhouse gases reflect it back to the surface, further warming Earth. People use this same process to warm greenhouses for plants.



Slide 7

What would be some aspects of a command and control approach to climate change laws?

How effective do you think they would they be?

What would the drawbacks be?

Could taxes be shifted? How would they work?

Could subsidies be used to encourage new energy sources? How effective would they be?

Name: _____

Slide 8

What is cap and trade?

Cap and trade is a regulatory tool that uses the market system to produce results. The government sets a standard of acceptable pollution (a cap) that may be released into the environment to guide reduction efforts in each facility; rewards companies' positive efforts; and, provides a framework to companies to trade with other companies that might have trouble meeting these limits.

Using a cap and trade strategy, the cap declines over time to meet the ultimate goal.

An emitter can sell surplus by "over-complying," which cannot happen under direct regulation. Note the surplus comes from efforts to reduce more than required, which is, in turn, rewarded.

Slide 9

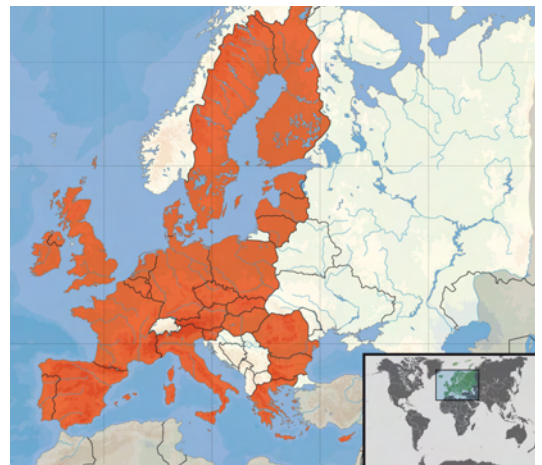
The European Union (EU) has the largest emissions trading system (ETS). It has been in operation since 2005.

Phase one of the EU's ETS was not an unqualified success. Some critics claimed that too many carbon allowances were circulated, meaning that air quality would not improve substantially.

Phase two of the ETS began in January of 2008, and many improvements have been made, but it is too early to tell if it will be successful in reducing carbon emissions.

Slide 10

Do you think the emission trading system could work in spite of the problems that critics point out about the European program?



Name: _____

Slide 11

Offsets are projects that reduce carbon emissions from activities that are not subject to a cap.

Voluntary markets involve selling carbon offsets to consumers, businesses, and institutions. They differ from compliance markets, in which the government mandates emission reductions and offsets serve as a tool for meeting emission reduction targets.

A factory can buy an offset from another country or receive credits for supporting a project that could be completed for lower costs than in their home country. This is what is known as a **clean development mechanism (CDM)**.

In order to be a CDM, the project must meet the approval of inspectors. One of the project features they look for is **additionality**. An additionality requires proof that the project would not otherwise be built without the incentive of the sale of credits.

Slide 12

What is a clean development mechanism (CDM)?

A CDM is a carbon-reducing project in a developing nation, such as India, where the cost of building a solar power plant, for example, would be cheaper than building one in Europe.

A European corporation can buy a **certified emission reduction credit** to help create that project and reduce the overall production of carbon. In order to be a CDM, the project must meet the approval of inspectors.



Slide 13

What is an additionality?

One of the standards is that the project must have additionality, the condition that a project would not otherwise be built without the incentive of the sale of credits.

Slide 14

Another kind of offset is called a “carbon sink.” A carbon sink is a natural absorbent of carbon, such as a forest, because trees naturally take in carbon and store it. They can reduce the carbon emissions problem.

In some cases, it might cost less to plant a forest than to make a factory emit fewer emissions. The carbon sink has the extra benefit of giving a forest monetary value, other than just for lumber.

Name: _____

Slide 15

What is a carbon sink?



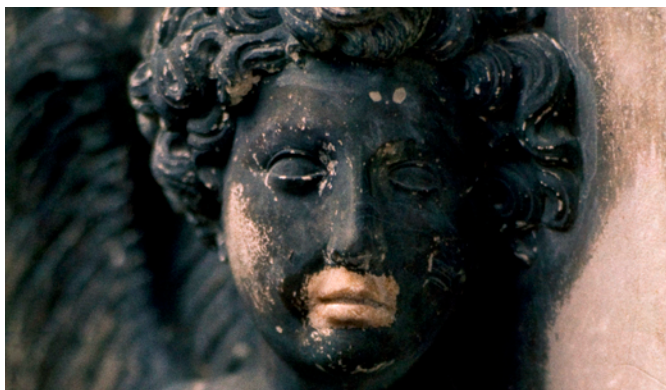
What is the extra benefit of a carbon sink?

Are there possible concerns related to using carbon sinks?

Slide 16

In the 1980s, acid rain—the contamination of rain with sulfur oxide and nitrogen oxide—became recognized an environmental problem. Acid rain damages buildings and monuments, affects forests and lakes, and can cause health problems.

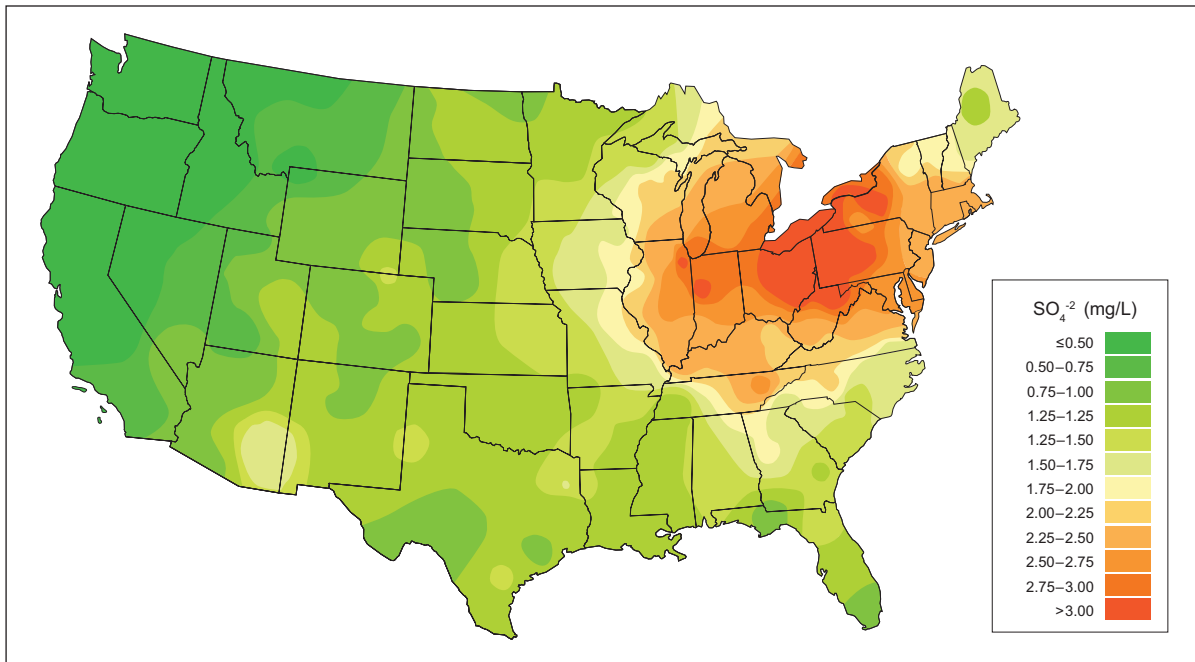
What are the economic costs of acid rain?



Name: _____

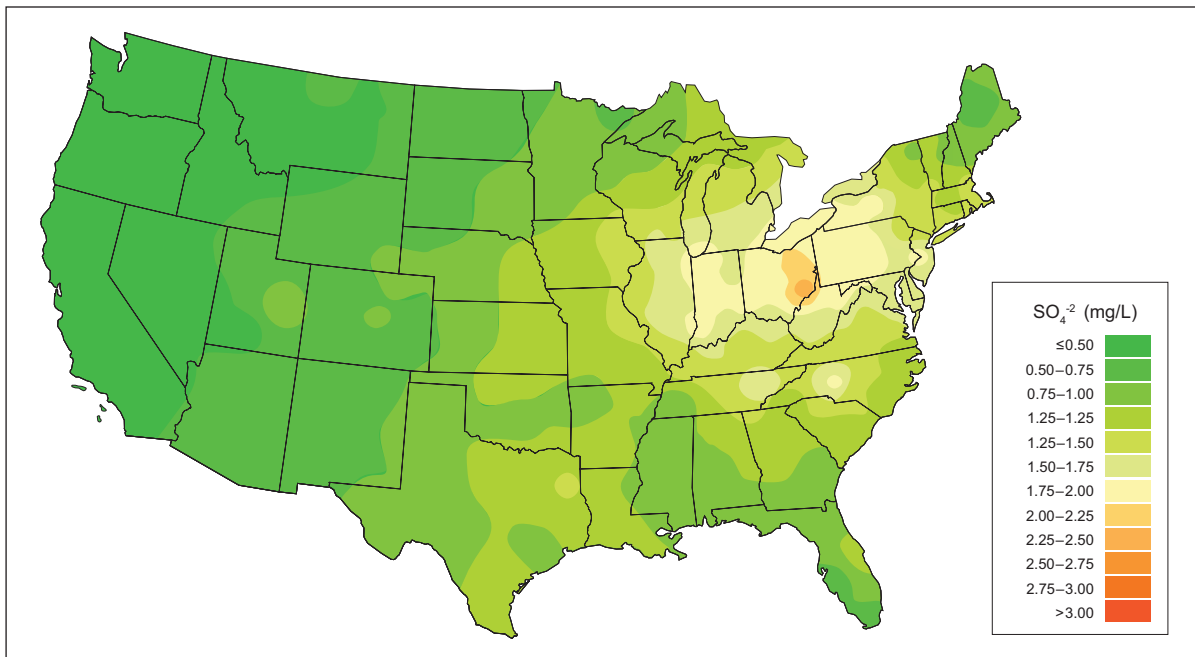
Slide 17

Sulfate Ion Concentrations 1985



Slide 18

Sulfate Ion Concentrations 2005



Name: _____

Slide 19

Cap and trade programs can work!

In 1990, Title IV of the Clean Air Act created a program to address the acid rain problem. Title IV's goal was to reduce sulfur dioxide to below 1980 levels.

The Sulfur Dioxide Reduction Program was a success. In 1980 sulfur dioxide emissions were at 25.9 million tons and in 2005 they were measured at 15 million tons.

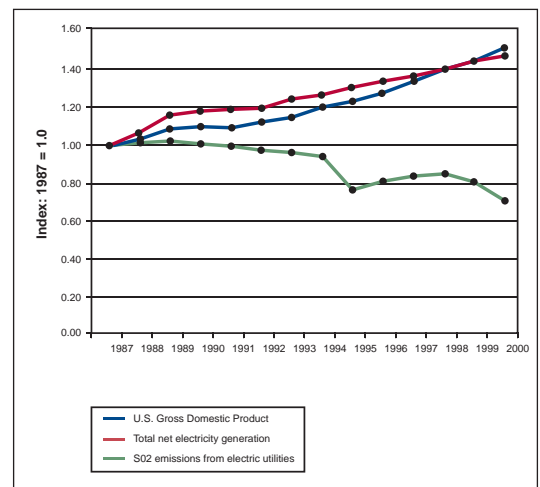
The sulfur dioxide reduction program used a cap and trade system.

Slide 20

Environmental Protection:

No Longer Environment vs. Economy

This graph shows that Gross Domestic Product went up with an increase in electricity generated at the same time that emissions went down. This shows that cap and trade can provide both a healthy environment and a healthy economy!



Cap and Trade System: Analysis

Lesson 5 Activity Master

Name: _____

Directions: Respond to the following questions. (5 points each)

1. What is a “cap and trade” program?

2. What role does the government play in making a cap and trade program successful?

3. What is an example of a successful cap and trade program? What was its goal? Give details of what it accomplished.

4. Instead of reducing carbon emissions, a company pays someone to grow or maintain a forest. Does this help solve the carbon emissions problem? Why or why not?

Emissions Allowances and Environmental Protection

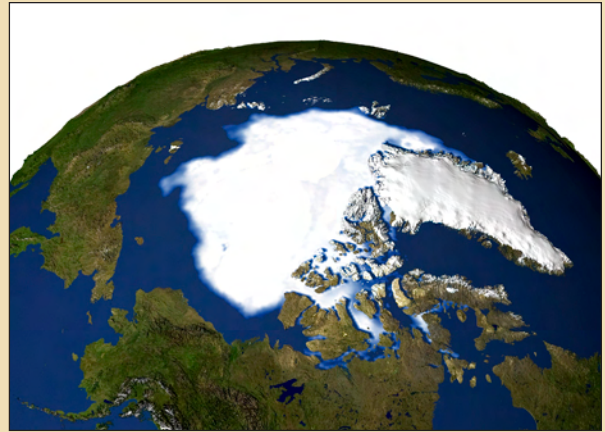
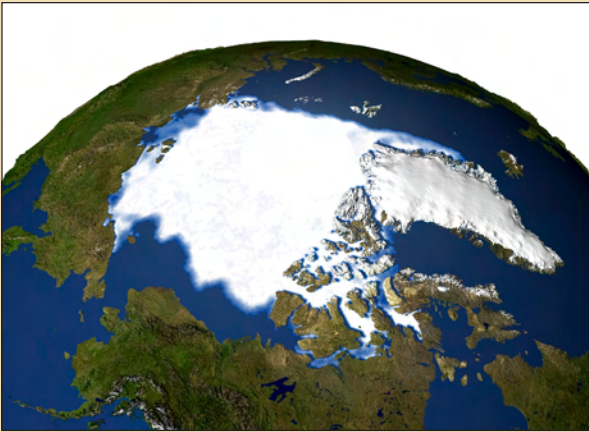
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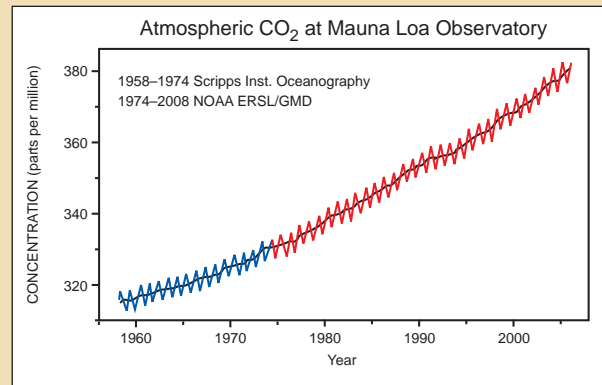
Emissions Allowances and Environmental Protection

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Currently, carbon increases can be traced to human consumption of coal-powered electricity, use of automobiles, and other sources.

With almost seven billion people living and consuming Earth's resources, it should not be surprising that human behaviors affect the planet.



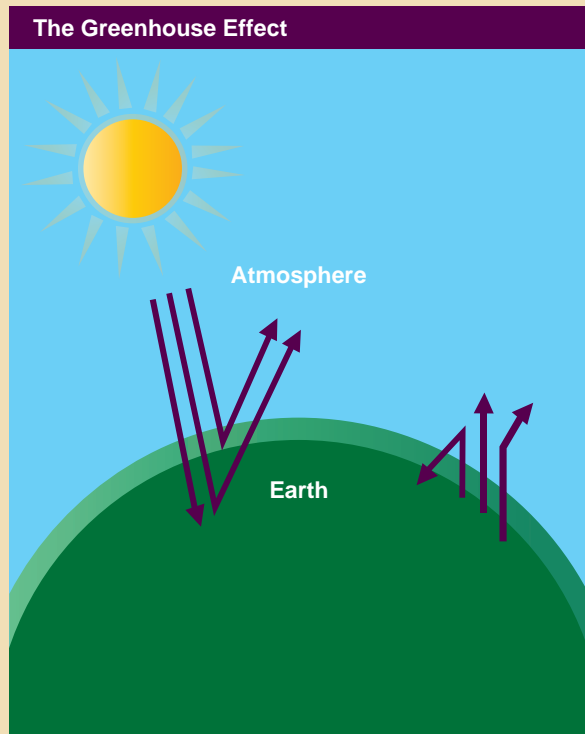
Emissions Allowances and Environmental Protection

What makes global climate change an economic problem?

What are some possible solutions to this problem? What would you recommend?



Emissions Allowances and Environmental Protection



How the greenhouse effect works.

When solar radiation gets to Earth some of it passes through the atmosphere and is absorbed by Earth and some is reflected out into space.

The atmosphere contains greenhouse gases such as water vapor, carbon dioxide, and methane. Increases in greenhouse gases cause the atmosphere to absorb more energy.

When the heat from Earth's surface rises, greenhouse gases reflect it back to the surface, further warming Earth. People use this same process to warm greenhouses for plants.

Emissions Allowances and Environmental Protection



What would be some aspects of a command and control approach to climate change laws?

How effective do you think they would they be?

What would the drawbacks be?

Could taxes be shifted? How would this shifting work?

Could subsidies be used to encourage new energy sources? How effective would they be?

Emissions Allowances and Environmental Protection

What is cap and trade?

Cap and trade is a regulatory tool that uses the market system to produce results. The government sets a standard of acceptable pollution (a cap) that may be released into the environment to guide reduction efforts in each facility; rewards companies' positive efforts; and, provides a framework to companies to trade with other companies that might have trouble meeting these limits.

Using a cap and trade strategy, the cap declines over time to meet the ultimate goal.

An emitter can sell surplus by “over-complying,” which cannot happen under direct regulation. Note the surplus comes from efforts to reduce more than required, which is, in turn, rewarded.

Emissions Allowances and Environmental Protection

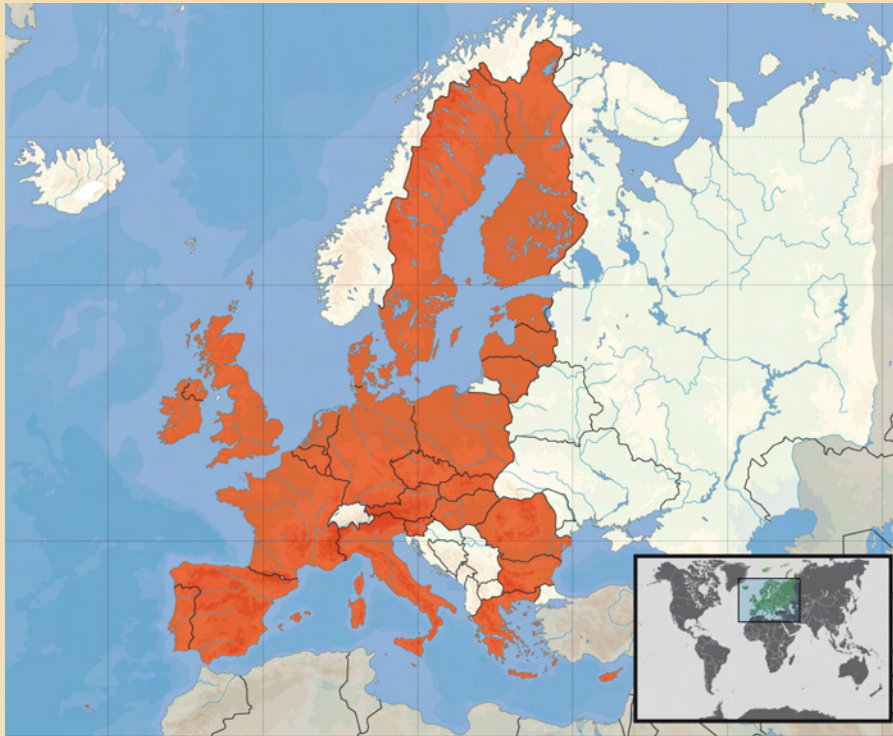


The European Union (EU) has the largest emissions trading system (ETS). It has been in operation since 2005.

Phase one of the EU's ETS was not an unqualified success. Some critics claimed that too many carbon allowances were circulated, meaning that air quality would not improve substantially.

Phase two of the ETS began in January of 2008, and many improvements have been made, but it is too early to tell if it will be successful in reducing carbon emissions.

Emissions Allowances and Environmental Protection



Do you think the emission trading system could work in spite of the problems that critics point out about the European program?

Emissions Allowances and Environmental Protection

Offsets are projects that reduce carbon emissions from activities that are not subject to a cap.

Voluntary markets involve selling carbon offsets to consumers, businesses, and institutions. They differ from compliance markets, in which the government mandates emission reductions and offsets serve as a tool for meeting emission reduction targets.

A factory can buy an offset from another country or receive credits for supporting a project that could be completed for lower costs than in their home country. This is what is known as a **clean development mechanism (CDM)**.

In order to be a CDM, the project must meet the approval of inspectors. One of the project features they look for is **additionality**. An additionality requires proof that the project would not otherwise be built without the incentive of the sale of credits.

Emissions Allowances and Environmental Protection

What is a clean development mechanism (CDM)?

A CDM is a carbon-reducing project in a developing nation, such as India, where the cost of building a solar power plant, for example, would be cheaper than building one in Europe.

A European corporation can buy a **certified emission reduction credit** to help create that project and reduce the overall production of carbon. In order to be a CDM, the project must meet the approval of inspectors.



Emissions Allowances and Environmental Protection



What is an additionality?

One of the standards is that the project must have additionality, the condition that a project would not otherwise be built without the incentive of the sale of credits.

Emissions Allowances and Environmental Protection

Another kind of offset is called a “carbon sink.” A carbon sink is a natural absorbent of carbon, such as a forest, because trees naturally take in carbon and store it. They can reduce the carbon emissions problem.

In some cases, it might cost less to plant a forest than to make a factory emit fewer emissions. The carbon sink has the extra benefit of giving a forest monetary value, other than just for lumber.

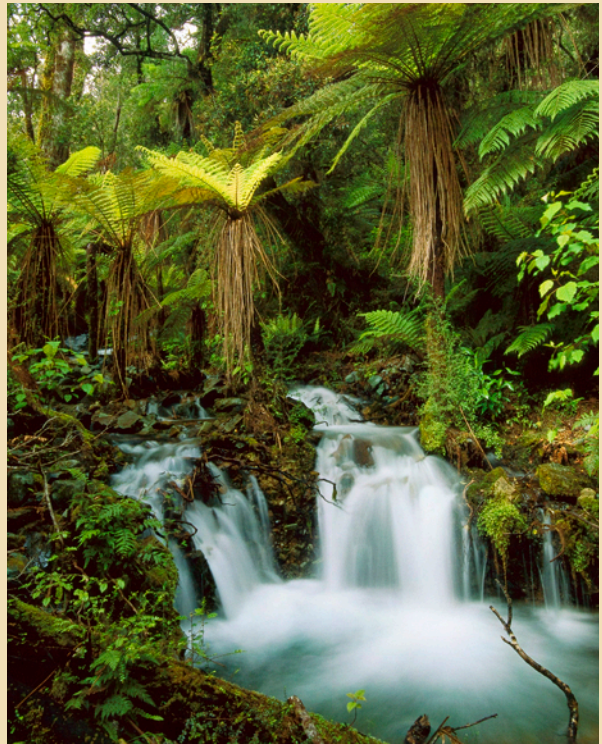


Emissions Allowances and Environmental Protection

What is a carbon sink?

What is the extra benefit of a carbon sink?

Are there possible problems with using carbon sinks?



Emissions Allowances and Environmental Protection

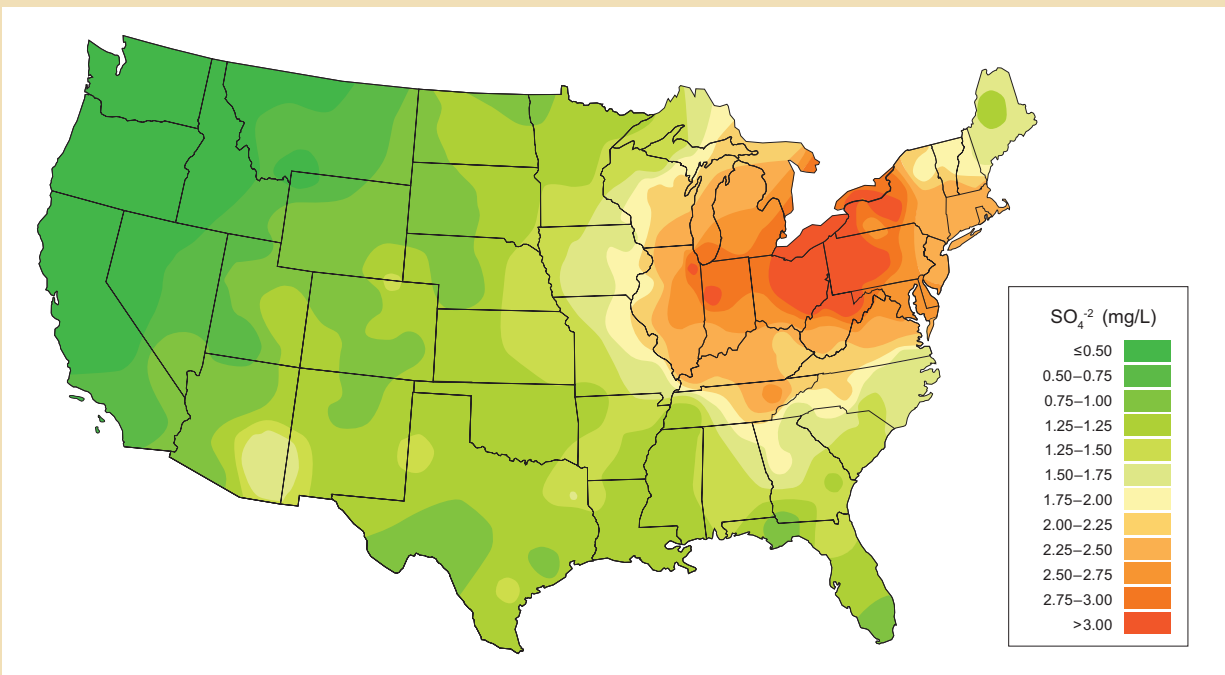
In the 1980s, acid rain—the contamination of rain with sulfur oxide and nitrogen oxide—became recognized an environmental problem. Acid rain damages buildings and monuments, affects forests and lakes, and can cause health problems.

What are the economic costs of acid rain?



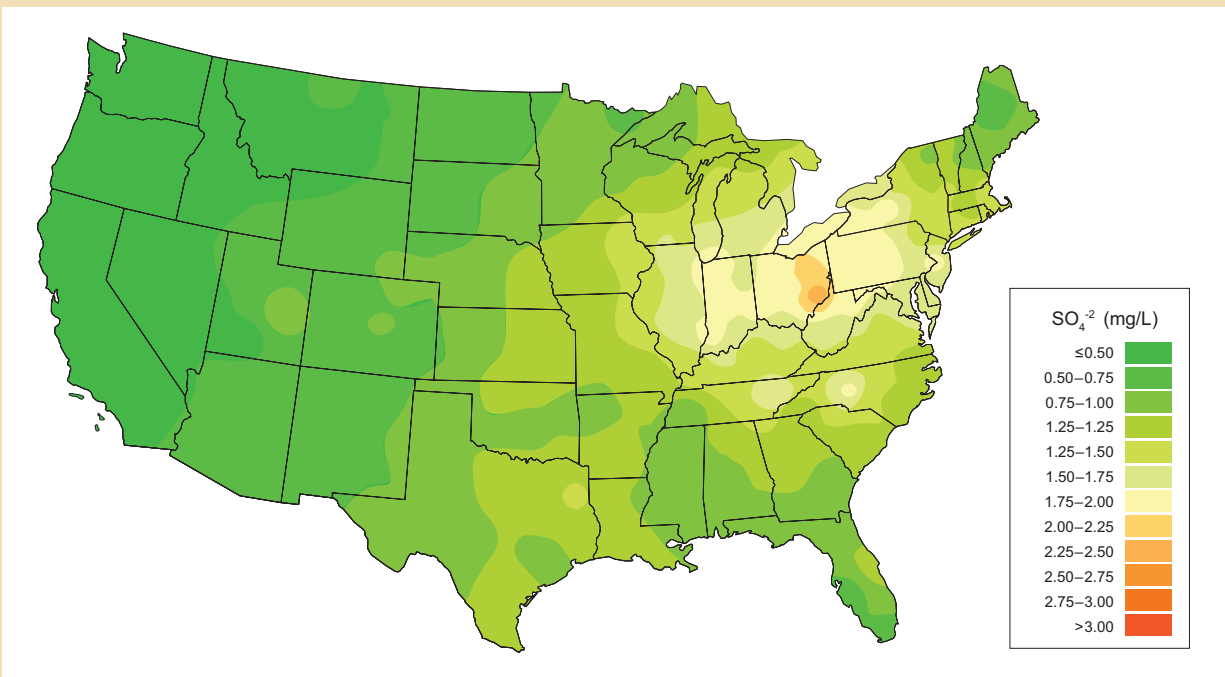
Emissions Allowances and Environmental Protection

Sulfate Ion Concentrations 1985



Emissions Allowances and Environmental Protection

Sulfate Ion Concentrations 2005



Emissions Allowances and Environmental Protection

Cap and trade programs can work!

In 1990, Title IV of the Clean Air Act created a program to address the acid rain problem. Title IV's goal was to reduce sulfur dioxide to below 1980 levels.

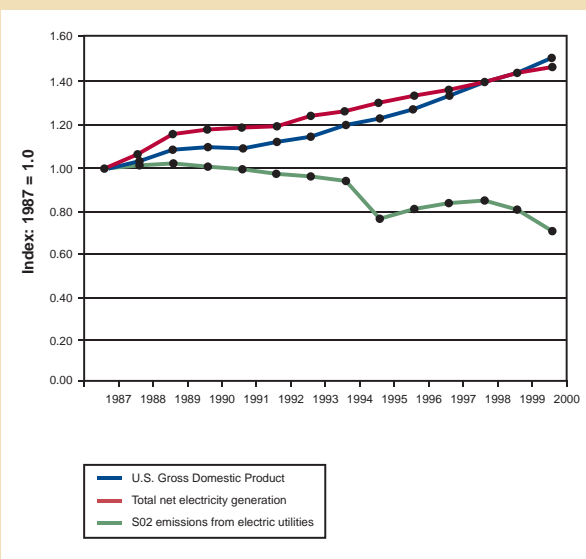
The Sulfur Dioxide Reduction Program was a success. In 1980 sulfur dioxide emissions were at 25.9 million tons and in 2005 they were measured at 15 million tons.

The sulfur dioxide reduction program used a cap and trade system.



Emissions Allowances and Environmental Protection

Environmental Protection: No Longer Environment vs. Economy



This graph shows that Gross Domestic Product went up with an increase in electricity generated at the same time that emissions went down. This shows that cap and trade can provide both a healthy environment and a healthy economy!

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California Education and the Environment Initiative

